Research Integration of Science and Engineering:
Technology Innovation & Data Engagement
(RISE TIDE)

CoPe Hub Model

Brian Glazer, Department of Oceanography, University of Hawaii, glazer@hawaii.edu
Devin Harris, Civil and Environmental Engineering, University of Virginia, dharris@virginia.edu
Donna Selch, School of Marine and Atmospheric Sciences, Stony Brook University, donna.selch@stonybrook.edu
James Lima, Bureau of Ocean Energy Management, james.lima@boem.gov

Introduction

Stimulating participation in coastal Science, Technology, Engineering, and Math (STEM) would be facilitated by investment in a Coastlines and People non-centralized hub. The hub would foster technology innovation, pertinent data, and knowledge and skill transfer relevant to coastal communities and its people. Beyond the technology transfer and unprecedented spatial scale data, the hub would provide communities recognition of their involvement and contributions in innovative distributive technology and projects. This paper outlines a conceptual model for a distributed technological innovation and data dissemination hub, gaining inspiration from an National Science Foundation-funded project working with traditional Hawaiian fishpond restoration communities, "Public Participation in STEM Research: Blending cultural and environmental resilience with contemporary technology: cutting-edge environmental sensor workshop for loko i'a" (OCE-1745567).

Present conditions

Coastal communities, collaborating with universities and other organizations have developed innovative, appropriate-cost technologies to solve a local-scale problem. In turn, these technologies have become incubators for additional data collection and application to other conditions. Knowledge, skill, and data sharing beyond this successful local application is often by happenstance, depending on the efforts of direct participants recognizing that their solutions are not unique to a specific place but could have broader application. Awareness of similarly-situated communities and solutions changes the conversation from "we can't do this because" to "we can do this if".

COPE Recommendation

Essential Features of the Hub:

(1) A decentralized, distributed hub for technical innovation, knowledge transfer, data science, integrating the efforts of scientists, graduate and undergraduate students, community colleges,

middle and high school students, and public participation in STEM research (PPSR) - public groups like NGOs, philanthropies, cities, counties, and municipalities.

(2) The hub enables technology transfer, crowd-sourced data, community engagement, unprecedented spatial data, cross-fertilization of geoscientists, social scientists, engineers, data scientists.

(3) The hub takes inspiration from a range of existing-but-distinct efforts such as the National Estuary Program, National Estuarine Research Reserves, Multiple Marine Cadastre, Ocean Observing Systems, local citizens monitoring programs; Sea Grant flooding photos, and Project OTIS, Ike Wai, & SMART Ala Wai in Hawaii. However, the non-centralized hub aims to facilitate cross-fertilization of research, education, training, and broadening participation efforts across the country.

What type of information will this Hub focus on?
The data and data sources for this hub are expected to be guided by discipline specific interests (i.e. geosciences - models and mapping, social sciences - local reporting community-defined important conditions, engineering - technology and implementation, data science - data and data integration), but the model aims to create a scalable framework to enable shared and open data access and technology transfer.

Example Data of Interest:
- Event/feature location
- Water level and water quality
- Imagery (tagged, geo-reference)
- Human observations that are the basis of traditional and local ecological knowledge.
- Social media (Twitter, Waze, Instagram,...)
- Meteorological data
- Engineered system failure
- Sensor measurements (metric specific)

Collection Platforms:
- Community participants - Low cost and motivated data source.
- Drones - Why drones? Other methods of data collection tend to be time consuming, costly, inaccessible/remote otherwise. Drones can minimize all of these concerns.
- Phones - Mobile data collection is provides a simple and scalable tool with a wealth of onboard sensing for both scientific and social data collection
- Distributed Sensors - Low cost, robust, reproducible, scalable, localized deployment

Results
- Websites - display data and results of data collection; marketing tool to reach new communities and possible collaboration
- Data Portal - emphasis on shared and open access data structure
- Story Maps - relay the cultural, social, and scientific results in a friendly layout
- Workshops - unite communities, schools, and scientists in a free flowing exchange of methods that can produce actional work based on prior experience both successes and

failures.
- Facilitate the conjugation of underrepresented communities and early career scientists.

Anticipated Outcome

Cooperation are expected to include a broad community of stakeholders including:
- NGOs
- Foundations and philanthropic organizations
- Cities, counties, municipalities
- Industry - Tech/startup/nonprofit incubator/accelerator.